

**WHAT IS CLAIMED IS:**

1. An amorphous film having an aligned atomic structure disposed on a substrate prepared by a method comprising the step of:  
5       bombarding said substrate with at least one ion beam from at least one ion beam source at a designated incident angle, wherein said ion beam has an energy from about 100 to 300 eV and said designated incident angle is from about 25 to about 60 degrees and wherein said amorphous film is a diamond-like carbon film, to simultaneously (a)  
10       deposit said amorphous film onto said substrate, and (b) arrange said atomic structure of said amorphous film in at least one predetermined aligned direction.
2. The amorphous film of claim 1, wherein said designated  
15       incident angle produces a net deposition on a surface of said substrate.
3. The amorphous film of claim 1, wherein said ion beam comprises impinging species and wherein the energy of said impinging species is kept below the energy required for etching said amorphous film  
20       on a surface of said substrate.
4. The amorphous film of claim 1, wherein said ion beam is generated by a process comprising the steps of:  
      introducing a carbon-containing gas into a discharge chamber of a  
25       source of said ion beam;  
      ionizing said carbon-containing gas in said discharge chamber to produce said ion beam comprising ions; and  
      applying sufficient voltage to said ion beam to accelerate said ions out of said ion beam source.

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5. The amorphous film of claim 4, wherein said ion beam has an energy from about 200 to 300 eV.

6. The amorphous film of claim 1, wherein said ion beam is  
5 generated using an ion gun.

7. The amorphous film of claim 1, wherein said ion beam further comprises neutral molecules.

8. The amorphous film of claim 1, wherein said bombarding is  
10 carried out simultaneously using a first ion beam and a second ion beam.

9. The amorphous film of claim 8, wherein said designated  
incident angle in said first ion beam is different from the designated  
15 incident angle of said second ion beam.

10. The amorphous film of claim 1, wherein said designated incident angle varies over time.

11. The amorphous film of claim 1, wherein said amorphous film  
20 is optically transparent in the visible spectrum.

12. The amorphous film of claim 1, further comprising the step  
of:  
25 placing a collimator in the path of said ion beam between said substrate and said ion beam source at a designated incident angle to sputter material of said collimator onto said substrate.

13. The amorphous film of claim 1, further comprising the step  
30 of:

moving said substrate or said ion beam source relative to the other over time.

14. An amorphous film having an aligned atomic structure  
5 disposed on a substrate prepared by a method comprising the step of:  
bombarding a collimator placed in the path of an ion beam from an  
ion beam source between said substrate and said ion beam source at a  
designated incident angle, wherein said ion beam has an energy from  
about 100 to 300 eV and said designated incident angle is from about 25  
10 to about 60 degrees and wherein said amorphous film is a diamond-like  
carbon film, to sputter material of said collimator onto said substrate and  
to simultaneously (a) deposit said amorphous film onto said substrate and  
(b) arrange said atomic structure of said amorphous film in at least one  
predetermined aligned direction.

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15. An amorphous film having an aligned atomic structure  
disposed on a substrate prepared by a method comprising the steps of:  
introducing a carbon-containing gas into a discharge chamber of an  
ion beam source;  
20 ionizing said carbon-containing gas in said discharge chamber to  
produce an ion beam comprising ions;  
applying sufficient voltage to said ion beam to accelerate said ions  
out of said ion beam source; and  
bombarding said substrate with at least one ion beam from at least  
25 one ion beam source at a designated incident angle, wherein said ion  
beam has an energy from about 100 to 300 eV and said designated  
incident angle is from about 25 to about 60 degrees and wherein said  
amorphous film is a diamond-like carbon film, to simultaneously (a)  
deposit said amorphous film onto said substrate, and (b) arrange said  
30 atomic structure of said amorphous film in at least one predetermined  
aligned direction.

16. An apparatus for depositing an amorphous film having an aligned atomic structure on a substrate, comprising:
- at least one ion beam source disposed at a designated incident  
5 angle of from about 25 to about 60 degrees capable of producing at least one ion beam having an energy from about 100 to 300 eV for bombarding said substrate with said ion beam to simultaneously (a) deposit said amorphous film onto said substrate, and (b) arrange said atomic structure of said amorphous film in at least one predetermined aligned direction.
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17. The apparatus of claim 16, wherein said amorphous film is optically transparent in the visible spectrum
18. The apparatus of claim 16, wherein said amorphous film is a  
15 diamond-like carbon film.
19. The apparatus of claim 16, wherein said designated incident angle produces a net deposition on a surface of said substrate.
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20. The apparatus of claim 16, wherein said ion beam comprises impinging species and wherein the energy of said impinging species is kept below the energy required for etching said amorphous film on a surface of said substrate.
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21. The apparatus of claim 16, wherein said ion beam is generated by a process comprising the steps of:
- introducing a carbon-containing gas into a discharge chamber of a source of said ion beam;
- ionizing said carbon-containing gas in said discharge chamber to  
30 produce said ion beam comprising ions; and

applying sufficient voltage to said ion beam to accelerate said ions  
out of said ion beam source.

22. The apparatus of claim 16, wherein said ion beam has an  
5 energy from about 200 to 300 eV.

23. The apparatus of claim 16, wherein said ion beam source is  
an ion gun.

10 24. The apparatus of claim 16, wherein said ion beam further  
comprises neutral molecules.

25. The apparatus of claim 16, further comprising:  
means for moving said substrate relative to said ion beam source.

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26. The apparatus of claim 16, further comprising:  
means for moving said ion beam source relative to said substrate.

27. The apparatus of claim 16, wherein said ion beam source  
20 comprises a first ion beam source to produce a first ion beam and a  
second ion beam source to produce a second ion beam for bombarding  
simultaneously with said first and said second ion beams.

28. The apparatus of claim 27, further comprising:  
25 means for moving at least one ion beam source relative to the  
others and relative to said substrate.

29. The apparatus of claim 27, further comprising:  
means for varying said designated incident angle in said first or said  
30 second ion beam such that said designated incident angle in said first or

said second ion beam is different from the designated incident angle of the other.

30. The apparatus of claim 27, further comprising:  
5 means for varying said designated incident angle in said first or said second ion beam over time.

31. The apparatus of claim 27, further comprising:  
means for moving said substrate or said ion beam source relative to  
10 the other over time.

32. The apparatus of claim 16, further comprising:  
a collimator in the path of said ion beam between said substrate  
and said ion beam source at a designated incident angle for sputtering  
15 material of said collimator onto said substrate.

33. The apparatus of claim 32, further comprising:  
means for moving said substrate or said ion beam source relative to  
the other and to said collimator over time.

20 34. An apparatus for depositing an amorphous film having an aligned atomic structure on a substrate, comprising:  
at least one ion beam source disposed at a designated incident angle of from about 25 to about 60 degrees capable of producing at least  
25 one ion beam having an energy from about 100 to 300 eV; and  
a collimator placed in the path of said ion beam produced from said ion beam source between said substrate and said ion beam source at a designated incident angle with said ion beam for bombarding said collimator to sputter material of said collimator onto said substrate and  
30 thereby simultaneously (a) deposit said amorphous film onto said

substrate and (b) arrange said atomic structure of said amorphous film in at least one predetermined aligned direction.

35. The apparatus of claim 34, wherein said ion beam is  
5 produced by a method comprising the steps of:  
introducing a carbon-containing gas into a discharge chamber of an ion beam source;  
ionizing said carbon-containing gas in said discharge chamber to produce an ion beam comprising ions;  
10 applying sufficient voltage to said ion beam to accelerate said ions out of said ion beam source to produce at least one ion beam from said ion beam source.

36. The apparatus of claim 34, wherein said amorphous film is  
15 optically transparent in the visible spectrum

37. The apparatus of claim 34, wherein said amorphous film is a diamond-like carbon film.

- 20 38. The apparatus of claim 35, wherein said designated incident angle produces a net deposition on a surface of said substrate.